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TRANSACTIONS.

NOTE.—This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

No. 808.

ADDRESS AT THE ANNUAL CONVENTION AT THE CHATEAU FRONTENAC, QUEBEC, JUNE 30TH, 1897.

By BENJAMIN MORGAN HARROD, President Am. Soc. C. E.

As we meet in this historic city, our Society is, for the second time, the guest of a hospitable neighbor and friend. In 1881 the American Society of Civil Engineers held its annual convention in Montreal. The President was then a man whose memory we recall with professional reverence and personal feelings of the most affectionate character, James B. Francis. In the opening of his address he took occasion to say that the membership was then 636, and that "the most interesting event to the Society, since the last convention, had been the purchase of a house, in the City of New York, as a permanent home, at a cost of $30 000."

It affords me pleasure to be able to state on our return to Canada, after sixteen years, that our membership has increased more than three-fold, being now 2 058, and that we have, during the past year, made arrangement for securing another "permanent home" at six

times the cost of the present one. This we hope, in a reasonable time, again to outgrow. Until then, we will extend a welcome there to our Canadian and other friends of the craft.

For many years the by-laws of the Society made it the duty of the President "to deliver an address at its Annual Convention, giving a summary of the engineering progress during the preceding year." No more appropriate theme could have been assigned for such an occasion, nor could a better method have been advised for preserving a record of such progress, fresh from the hands of those who had largely contributed to it. But the duty was discharged with increasing difficulty from year to year. The field has now become so extended, and the duties of engineers so specialized and exacting, that a satisfactory account of the general progress cannot be rendered by any one participant in the movement.

The rapid growth of societies of engineering specialists has also created opportunities for the performance of this important work with greater fullness and detail. The specification of the constitution is now more considerate, requiring only that "the President shall deliver an address at the Annual Convention," and leaving to him the choice of subject.

I shall endeavor, therefore, on this occasion to present a brief view of the relations of civil engineering to the progress of the present time and country; of its opportunities and limitations, and of the responsibilities and duties of our Society; together with such suggestions as occur to me for promoting its prosperity and influence, as the national exponent of the profession.

The growth of our country in extent, numbers, wealth and comfort is more largely due to the civil engineer than to any other of her citizens. His work has made possible the occupation of the entire continent by cultivated and prosperous communities. Without the post-road, the canal with its incline planes and locks, and then the railroad with its bridges and tunnels, Americans would still be lingering, "a feeble folk," along the Atlantic seaboard, with the Appalachian chain for a barrier, crossed only for curiosity or adventure. To make the recesses of the great Central Valley and the Pacific Slope conveniently and cheaply accessible to all men, to exploit their resources, to turn their waters to the service of life and trade, to connect them with the civilization and markets of the world, and to make them in-

dependent by the diversification of profitable industry, until it now ranges from the extraction of food, material and fuel from the soil and mine to the finished product of the highest skill and organization, was the service of development required in earlier days. Although this work is now, in many of its aspects, approaching completion, and the duties of the engineer in the complex society of the present day are in many respects different from those required when the country was younger, yet they bear a not less intimate and important relation to the public welfare. This has been well expressed by a Past-President when developing, before another audience, the line of thought opened by him at our Annual Convention two years ago.

"The functions of the Government are changing; the demands of the new epoch are not like those of the past; safety from foreign invasion is needed less than safety from dangers which lurk within, from the poisons, both moral and physical, which endanger concentrated population; from bad air, bad water and bad construction; from corrupt administration and from bacteria. In cities and in many communities the duties of the government rest more on good engineering than on legal skill. The whole life of the community depends on appliances and conveniences which the manufacture of power alone has made possible. For all this work the Government needs neither soldiers nor lawyers, but men educated in the various departments which come within the broad definition of the work of the civil engineer. The rulers and governors, who at first were soldiers, who subsequently were selected from men trained as lawyers, must in the future be taken, at least in part, from those who are educated in the utilization of the powers in Nature, from civil engineers, and the men who are equipped with the new education for the benefit of their country."

The new demand for the services of the civil engineer is due to the extension and greater complexity of the social organism, and requires for its supply more varied scientific knowledge. Its field includes the manufacture of power from new sources, air, gas, electricity, and the contrivance of new tools for its utilization. It calls for better sanitation, ventilation, heat and light; the improvement and cheapening of all processes of manufacture; the application of power in smaller units for domestic purposes, and its accumulation in great central plants for commercial distribution; for more rapid transit, both in municipalities and for great distances; for longer bridges, higher buildings and faster steamships; for deeper rivers, harbors and lakes, and for stronger levees.

There is also an increasing demand for the expert administration and development of those departments of great corporations, already established, whether for civic or industrial purposes, which require scientific knowledge, trained judgment, skill in detail, promptness in action, and familiarity with responsibility. These qualities make up the equipment of the civil engineer, and, having been developed by designing and constructing such work, they fit him peculiarly for its maintenance and betterment. Many of the largest and best managed corporations have already placed their administrative and scientific departments in the hands of trained engineers, and are seeking the educated intelligence of graduates of engineering schools for practical positions in their operating departments.

If the function of a learned profession is the increase of scientific knowledge and its application to the promotion of the welfare of society, Civil Engineering has been raised to that position by the learning, character and achievements of its members during the nineteenth century. A knowledge of the forces in Nature by the utilization of which human life has been prolonged, the necessities of life made plentiful and cheap, the comfort and security of all sorts and conditions of men increased, the opportunities of study and travel enlarged, and a new direction given to the thought and energy of the world—this knowledge, on which civil engineering is based, is a part of the liberal culture of the age, and by the possession of it that profession is distinguished from a mechanical art.

If this estimate of what the civil engineer has already done and has still to do for the future development of this country is reasonable, such an occasion as the present is opportune for the consideration of the means by which our duties to ourselves and the public can be best performed, and wherein this can be promoted by an American society, where engineers from all parts of the continent, engaged in any work requiring the scientific application of "the forces in Nature for the use and convenience of man," can meet on common ground and unite, as a body, in such measures as will most efficiently accomplish the objects they have in view.

The attempt has been made by some professions, which has had sincerely in view the public and private interest, to attain these objects, and, at the same time, defend themselves against the Bashi-bazouks of the calling, by protective legislation. I believe that the

experience of the past, in this direction, has not been encouraging, for, on the one hand, the public is disposed to view any such measure with a suspicion and resentment which would be likely to thwart its benevolent intention, and, on the other, the advancement of science is no longer an infant industry, needing protection against the waning powers of ignorance and pretension. It will be more satisfactory, in the long run, if the struggle for existence is allowed to go on, the engineer acquiring his status by hard work, and the people their experience by hard knocks, in order that adjustment may be final and permanent. The tendency is now towards the accomplishment of the same ends by a higher education, more scientific work, and closer personal and professional co-operation among members. In evidence of this is the increasingly thorough and extended courses in the better class of profession schools, the more general employment of trained engineers, and the growth of scientific societies in influence, activity and tone. The School and the Society, rather than the Legislature, are the tools we need for working out our professional salvation.

The same thought may be applied to what are called "codes of professional ethics." Of course, a strong and cultivated moral sense, of which the Golden Rule forms the larger part—absolute good faith and fidelity towards all men, and particularly among fellow-workmen —is the foundation of all social and professional relations, being, perhaps, stronger and more necessary among engineers, in proportion as their responsibilities to the public and to each other are greater than in some other vocations. But this must be a plant of natural growth, with roots deep in the moral nature, made strong and hardy by exposure to the vicissitudes of life, and kept green by professional good-fellowship. A code which has to be proposed, and seconded, and debated, and amended, and passed by a majority vote, can hardly be counted on for the necessary virility in the time of trial. If the principles of such a code met with general acceptance there would be no occasion for its formal adoption. If they were not so accepted, its enforcement would be a matter of doubt and difficulty. If it were not uniformly enforced, a righteous expression and effort would fall into contempt, a desuetude which would not be innocuous, and the last state of that profession would be worse than the first. The prevalence of social order and the progress of humanity and culture is more largely the result of a trained and enlightened public sentiment than

of all the laws and all the courts, and its influence will afford the surest reliance in the conduct of our public and private relations.

I have said that the service rendered by engineers to the community can be made more efficient by their organization in a body for the encouragement of professional fellowship, the comparison of results and the discussion of the problems of the future. Organized co-operation is one of the conditions of progress in engineering, as in other applied, and particularly constructive, sciences.

There is no greater record of constructive skill in the past than the cathedrals and other public buildings of the Middle Ages. This result could only have been accomplished by a wide diffusion of technical knowledge and skill throughout the whole body of craftsmen, by means of their organization into guilds whose object was not, primarily, discipline, but the promotion of social and professional fellowship, and the dissemination of a knowledge of their work. Their contribution to the constructive science and the general culture of their times was very great, and the influence they thus acquired was, for a time, beneficent. They broadly differed, at first, from the organizations of the building trades of to-day in their motives, which were reasonable and humane, and in their methods of work and conduct. But, with increasing power, they became arrogant and turbulent, and sought through protective legislation, special privileges and exclusive rights, which the love of freedom, then growing, would not tolerate. The resentment thus created led to internal strife, general antagonism, and, finally, to their extinction, as uncongenial to the spirit of the times. It is not likely that any similar effort will succeed better in these more liberal days.

In an art, the individual is everything, and the results are not cumulative. The high-water mark of the arts has not been raised for centuries. Its great achievements preserve their relative greatness for ever. Its leaders have not made it easier to write, or paint, or carve, nor, I am sorry to add, have great orators made it easier to deliver an annual address. This is not the condition or limitation of an applied science, which is helpful, and whose results accumulate. Every good piece of original engineering work not only helps the world to live in greater comfort and security, but enables many engineers to do as well, and some to do better. The test of its worth is its absorption into the general body of engineering practice for the use of all men. At first a cap-

stone, it afterwards assumes its orderly and honorable place in the foundations. Those who follow art must all start from the same datum plane, and the point they reach is limited by the span of human life; but engineers may begin where their predecessors left off, and each, in his day, may share the advantage of the dwarf in the proverb, who, mounted on a giant's shoulder, sees farther than the giant.

The reward of the artist is therefore more personal than that of the engineer.

The distinction which I have here tried to indicate is curiously illustrated in the fame left by, probably, the most highly gifted man the world has ever known, Leonardo da Vinci, engineer and artist, pre-eminently, also scholar, soldier, author and philosopher. When the conditions of his time are taken into account, it seems that he excelled his fellow engineers even more than his fellow painters, for Michael Angelo and Raphael were the contemporaries of his maturer life. Yet he is now known to fame almost exclusively as an artist. For one who—wondering at the great locks at the Sault Sainte Marie—remembers him as the inventor of that system of artificial navigation, through which the greatest commerce of the world passes unvexed, there are hundreds who recall with admiration the painter of Mona Lisa and the Last Supper.

Since organized co-operation among the members of a profession affords a stimulus for interest, and an opportunity for the increase and systematization of learning, which is essential for the freest development of the applied sciences, this century, in which the progress of the learning on which these sciences is founded, and the increase of the uses to which they are applied, has been unprecedented in the history of the world, has therefore been specially marked by the birth and growth of scientific societies of all kinds. It was but natural that civil engineers should take a very prominent part in this movement, impelled by the necessity for a more complete organization of their department of knowledge, and the desire for a common ground on which to meet to compare results and collect information for future generalization, and establish kindly personal and professional relations. The lawyer, the doctor and the clergyman—unless he happens to be a missionary—find the scene of their labors where population is concentrated, where their fellows are their neighbors, where libraries are accessible, and an atmos-

phere of culture and learning prevails. On the other hand, a large part—and particularly the earlier part, when the social instinct is strongest—of the lives of many engineers is passed without these advantages and alleviations. Hence, engineering societies, supplying a want otherwise unsatisfied, are numerous and prosperous, and the good civil engineer is apt to be a good society man.

As the growth of physical science, of the knowledge of the forces in Nature, of their laws and methods of application to the demands of the complex civilization of to-day, has been abnormally rapid in this age, that tendency towards specialization, which is more or less observable in all lines of life, has had an unusually marked effect on our profession. To acquire such efficient knowledge of all that is included in the definition of civil engineering to-day as will fit one to deal with each or all of the problems which its practice presents, is beyond the limit of a single life, or the reach of a single mind. We are all necessarily, more or less, specialists, and each one has, and ought, to do what he can do best. The never-ending examination, which we call the struggle for existence, is assigning, or seeks to assign, each of us to the special work for which he is best fitted.

In the primitive days of the world, the wants of a man and his family were so few and simple that he could supply them all himself, courting his wife with a club or lariat, building his shelter, making his clothing, and digging or killing his food. With the increase of personal wants commenced the division of labor. So, in the earlier days of the profession, the demands of the public from engineers were so few and progress was so slow, that a complete knowledge of the arts required to supply them was within the reach of a man of good mechanical ability, combined with the other qualities which make for success in life. But the men of universal knowledge and achievements, like da Vinci, Crichton, or Leibnitz, are figures of the past, and that learning and education which was once called liberal because it was free from limitations, and could range all over the then known world, is now but a tradition. As the knowledge of astronomy has displaced this world, around which the sun, and moon and stellar universe were formerly supposed to revolve for the edification of its inhabitants, from its central position to a subordinate place in a single solar system, so we are all co-ordinated by the growth of scientific knowledge, which

has consigned the best of us to the use of but a few tools, at most, in Nature's workshop.

This is the sufficient reason for the existence and prosperity of numerous societies dedicated to the study and practice of some special department of engineering science. They are so obviously the result of natural and healthy growth, a part of the process of differentiation from the simple to the complex, under the laws of evolutionary progress, that they constitute an important factor in the intellectual and educational influences of the profession.

But there is another plane of cleavage along which American engineers divide. The distances across our country are magnificent, and we, in large proportion, are stationed at the outposts. Frequent resort to a single and far distant center is extremely difficult for men whose employment is so exacting as that of the civil engineer, and, therefore, many are compelled to forego, to a great extent, if not entirely, those opportunities of social intercourse which the Society is designed to promote and which, as experience has showed, contribute largely to the success and interest of professional life. The general recognition of the necessity for social and professional organization for the advancement of the work and interests of civil engineering, combined with an experience of the limitations which are imposed on some of the functions of a national society by the differentiation of the special departments of study and practice, but more especially by the extent of the field over which its members are scattered, has created a natural demand for full and equal participation in all the benefits which organization can confer, and has led to an increase in the number and prosperity of local societies which substantially promotes the growth of scientific knowledge, interest and good fellowship.

This specialization of work and interests which has led to this subdivision of the profession on topical and local lines must, therefore, not only be accepted as part of the natural trend of events, but also acknowledged as an important factor in engineering progress. But it surely involves a tendency towards partial development, and, to that extent, is accompanied by serious peril of atrophy or degeneracy. It might appear, at first sight, that the greatness of both the country and of the profession were obstacles to the adequate development of a national society. On the contrary, the conditions which I have recited are both reasons and incentives for averting this peril by an organiza-

tion whose chief function is the maintenance of the unity and dignity of the profession by the advancement of that general engineering knowledge upon which the successful practice of all its branches is conditioned, and by strengthening the ties of fellowship among American engineers. The accepted philosophy is that one law underlies all truth and its phenomena. One phase of it, the physical forces in Nature, is the foundation of all civil engineering, and a general knowledge of them and their laws is necessary for their successful utilization, in any department, in the service of man. This conviction of the importance of a liberal education as the foundation of eminent success in special branches of learning is now modifying the attitude of other professions and educational institutions. The greater universities of the country are now beginning to require a graduate's degree, as a condition of entrance, from those who propose to follow special courses in law, medicine and theology. The general movement for higher education will, in time, exact equal preparation in civil engineering and the other newer professions. Certainly an organization of educated men, devoted to the advancement and application of a useful science, to secure for themselves a common ground for the exchange of information, the comparison of methods and results, and the collection of material for future work, either by the presentation and discussion of papers, or by personal intercourse, may be considered among the most effective educational agencies of the time. This is more largely true of civil engineering than of other similar societies, on account of their more frequent meetings and the regular and valuable papers and discussions which form so large a part of their proceedings.

Under these conditions, a national society is not only a part, but the head and front of a great system, founded on the necessity for general scientific culture and the fellowship of American civil engineers. It bears the relation to other societies that a university does to a college. It should supplement and round out the work of those societies which specially pursue one branch of learning and practice, by making its prominent function the presentation and illustration of the general truth of engineering science, which is the root and trunk from which all the branches spring.

It represents the Federal idea, and should lead the special and local societies, not only to closer union among themselves, but also with a central institution, with the bond of a common object, of a

love for all knowledge which is included in the constantly broadening definition of civil engineering, and of kindly professional feeling and intercourse. Our ranks are full of the distinguished members of the special and local societies, and, in turn, they have many members who should belong to us, from their eminence and learning, men who do not confine their interest and work to one department of the profession or to the material progress of one part of our common country. It is not too much to say that the prosperity of our Society is closely interwoven with theirs, as the product of the same social and professional instincts.

The subject of a closer alliance between these organizations than at present exists has, on several occasions, received consideration, leading to the conclusion, by both parties, that the conditions favorable for such a measure did not then exist. They probably do not now exist. But it seems to me that the proper mental attitude on this subject is to recognize, as a fact, that some such alliance is natural and desirable; and to seek to promote the conditions which will make it, at some future time, practicable. This view leads to no contention, for persistence in the traditions and policy which have already given to this Society its great measure of success, together with the general pressure for higher education, are the most certain means of bringing about such conditions.

It is true that the idea of professional and social organization can only attain its full development in a national society, and only then, provided its membership is large and represents the highest grade of attainments, its *Transactions* of wide range and high merit, its library comprehensive and accessible, and its home attractive.

The British Institution of Civil Engineers, at its last annual meeting, had under consideration the revision of its terms of admission to membership. Certain changes were then made which, in the opinion of the President, Mr. J. Wolfe Barry, would be found of great value to the outside world, since they would be a guaranty that a member of the Institute, wherever found, possessed that amount of scientific knowledge on which all civil engineering must be based. It would also be of great value to the Institution, raising it, as a body, to its proper position, and enabling it to keep pace with those developments of scientific research which are continually being brought to light.

The requirements for membership of that great society, as they now exist, may be described as opening three ways, through either of

which an applicant may enter: first, professional education, tested by examination, combined with a prescribed amount of practice; second, a prescribed amount of practice, with a professional equipment, tested by the presentation of a satisfactory paper or thesis on an engineering subject; and third, satisfactory proof to the Council of adequate training, practice and fitness, without either examination or thesis.

While this position shows the intention of the British Institution to advance professional and public interests by raising the standard of membership, it may not be assumed, without careful consideration, that a movement along the same line would best accomplish the same object under the conditions of thought and practice in this country. But the expediency of steadily raising the standard of membership is so obvious that it is hardly a subject for discussion. It is rather a part of the general movement of the times for the advancement of learning. On the one hand the preparation for practice is becoming more difficult, from the increase of knowledge, and the duties more exacting from the enlargement of the field of civil engineering work and the variety and magnitude of its problems. On the other hand the professional schools are, year by year, sending out men better equipped and trained for work. So the forces are applied from different directions, and determine the path this Society must follow, if for no higher reason, to keep in touch with the times.

An engineering society, in the selection of its members, cannot follow strictly academic or doctrinaire lines. They may come from the schools, or from other and opposite directions. It must draw its life from every element, and it is entirely likely that the most valuable accessions may be from unexpected sources. Sometimes the engineer, like the poet, *nascitur, non fit*, and, occasionally, a profound insight into Nature's laws comes as did Dogberry's writing and reading. The men who have been drawn into the profession by an irresistible impulse of genius rather than by a carefully regulated training have done their full share in raising civil engineering from a mechanic art to one of the most scientific and useful of professions. It must have a welcome for all who can give satisfactory answer to the questions: What have you done? What can you do? Room must be made for those who have either attained eminence by general practice and learning, or in some special branch of engineering science; for those who conceive and promote great enterprises, and those who elaborate

the methods and details; for those who organize the plant and labor, and assume the responsibility of their prompt and economical performance, and those who enforce their specified execution; for those who administer and develop transportation and manufacturing enterprises already established; for those who improve our rivers, harbors, mines, and alluvial and arid lands; for those who build our land and sea defences; for the scholar in engineering, and for him who has been led, by strong natural faculties, to follow the calling of a civil engineer.

In each of these classes is to be found the required material; and, as the claims of the profession for public confidence are based on practicable achievement, so the best individual claim to any honor or benefit which membership in the Society can confer should rest on the work he who seeks it has done, or can do.

Since the prosperity of the Society is so entirely dependent upon the character of its members, it is important that the machinery of election should be of the most perfect kind. With this object, I believe that certain changes in that part of our constitution regulating elections, which are in the line of the experience of other large associations for social, business, or scientific purposes, should receive consideration. The present system of proposal and investigation, the Membership Committee and the Blue List, is entirely good. But, after them, it remains in the power of those who have not seen fit to express any objections they may have, on the opportunity afforded by the Blue List, or of those whose reasons may not have appeared sufficient to the Board of Direction, to render a verdict of such importance that a prudent man may well hesitate before he accepts the risk, no matter how well he may be qualified. A more serious view is that the present method may occasionally admit of the infliction of wrong or injustice. I believe, for these reasons, that the responsibility of final election could be entrusted to the Board of Direction with benefit to the Society.

The chief function of an engineering society is the preparation, discussion and publication of professional papers. They constitute the reason for its existence, and its claims to consideration. With us, they fill the place of the annual reports of decisions with lawyers, with the advantage that, if we do not like the precedents they establish, we are at liberty to improve them.

The American engineer has not been prolific in the literary work of his profession. We are largely dependent upon foreign countries for

its history and principles. This is but a general statement to which there is an increasing number of exceptions. It is probable that the nature of the engagements of civil engineering in this country has not been as favorable for such work as elsewhere. Here it has been largely in new and remote fields, at stations where privations were encountered, where time was all important, and where the facilities and opportunities for literary work were not available. It is also probable that in the past, at least, a larger proportion of foreign engineers have been equipped with the necessary academic preparation and habit. Therefore the *Transactions* of our Society form the main body of American engineering literature.

The discussions which form a large part of them are extremely valuable. It has been said that pamphlets are apt to be more interesting than books, and foot-notes than the pages to which they refer. There may be many reasons for writing a book, and it may often be perfunctorily done. But it is generally the case that he who writes a pamphlet, or a foot-note, has something which he feels it is important to say, with emphasis. For the same reasons, it is fair to assume that he who enters into a scientific discussion has opinions which are the result of personal study and experience, and which he is prepared to defend with clearness and vigor. They also elicit facts which, while they might not be sufficient basis for a separate thesis, are extremely important, and could be brought out in no other way.

The *Transactions* of the American Society of Civil Engineers are the record of the history of American engineering, and in its list of contributors are the names of those men who have made this history. These volumes are the foundation on which the high character of the Society rests, and by their increase in number and value will the progress of engineering learning and the welfare of the profession be best assured. The importance of this part of the work of the Society imposes a duty on every member, while he is afforded the privilege of access to an audience which he can reach in no other way than by its discharge. The appeal is thus to professional pride and self-interest, and to loyalty to the Society and his fellow members.

The occupation of the New Society House will give opportunity for the development of the library both in extent and usefulness. The proposed arrangements for stacking and reading are excellent. Whether the library is hereafter to be open to the public, to all

seeking information on engineering topics, or is to be a private storehouse for such knowledge, is a subject which seems to me deserving of very serious consideration. The former course appeals to us by its liberality and public spirit, as a measure for the general advancement of learning. I am informed that it will also be accompanied by certain advantage, in a freedom from taxation. It would therefore be in harmony with the policy of the State, for the promotion of knowledge. If, on the other hand, it is decided to make it a close library, the justification for this course would only be found in a great extension of the privileges of its owners, the members of the Society, by facilitating its uses for them in every reasonable way. The first object of a library is not to preserve books, but to get them together in position for convenient use. If this is so thoroughly done that they are rapidly used up, so much the better. Their end has been accomplished, and others can be put in their places. I am aware of the fact that, in the past, the library has been open to those desiring to consult it, and that this was understood to some extent. But in the future the policy of the Society in this matter should, I think, be more clearly defined and widely declared. The happiest solution would combine both access for the engineering public, and extended special privileges to members.

Among the benefits of membership should be the opportunity of conveniently and cheaply securing, by correspondence, an abstract or summary of engineering literature on any point or subject, so far as it may be contained in our library. I believe that this system would meet a reasonable want of many members, for engineers generally have not the constant opportunity of collecting or consulting books that belongs to more sedentary professions. This system would involve an expense for which, at present, the Society may not be prepared, and at the beginning sufficient fees to cover the cost of the service might be required. But as the system and the Society prospered, the application of a part of its revenues to the reduction of these fees would be a proper and legitimate expenditure for the promotion of the main object of the Society, the increase of engineering knowledge among its members.

It would also be a proper subject for consideration, and, perhaps, of experiment, to ascertain if a system of loaning books to members, under certain restrictions, secured by deposit, or otherwise, could not

be devised, with a gain to learning more than commensurate with any loss or trouble that might be incurred. The more modern museums freely lend specimens to responsible naturalists, and, while there is, of course, a certain danger of loss, the advantage to science, through the opportunity of investigation thus afforded, more than counterbalances an occasional mishap. The same practice is increasing in libraries. The public library of New Orleans has now, organized and in popular use, a department, promoted by special gift, known as the "Traveling Library Association." Under this system, any one of several selected collections of fifty standard books is sent to any country town in Louisiana or an adjacent State, on the application of three citizens, for a term of six months, without other expense than the charge for expressage. The only condition attached to this loan is that any loss or damage, other than that from ordinary wear, shall be made good by the payment of the cost or the replacement of the book, and that one of the applicants shall assume the duties and responsibilities of a local librarian. While this system is new in New Orleans, it may be in common use elsewhere. Of course, in a museum, types, certain fossils, and links in a series, are excepted from this liberal custom, just as certain books, such as those out of print, original or special editions, and some others, would reasonably be excepted in a library. I am aware that anything of this kind could only be done under a system that would protect the interest of the many from the carelessness of the few, and the library from serious mutilation. The consideration of the practicability of such extensions of the benefits of the Society is the limit of my suggestions.

And now "dost thou think, because thou art virtuous, there shall be no more cakes and ale?" Shall we not add to the sedate and serious pleasures of "plain living and high thinking," of a sense of useful service faithfully rendered, and of an active and honorable share in the progress and civilization of this wonderful age and country, the social pleasure of that friendly intercourse which lightens work, quickens interest, and sustains enthusiasm. The social faculty is well developed in the *good* civil engineer, and he has not neglected, in this Society, to provide occasions for a most judicious mixture, or blend, of personal friendships with professional benefits.

To such an occasion I have the pleasure and honor of bidding you welcome.

MEMOIRS OF DECEASED MEMBERS.

JAMES LAURIE, Past-President Am. Soc. C. E.*

DIED MARCH 16TH, 1875.

James Laurie, the first President of the American Society of Civil Engineers, was born at Bells Quarry, near Edinburgh, Scotland, on May 9th, 1811. He lived in Scotland for some time, and once, during his boyhood, when hurt through some accident, was found by Sir Walter Scott, who was out fishing. The latter at once abandoned his excursion until he had secured attention for the injured boy.

Among his earliest professional engagements in this country was one as Associate Engineer with James P. Kirkwood, on the Norwich and Worcester Railroad. That line was constructed under their direction in 1835 and subsequently, and was probably the first road in this country on which a tunnel was built. His work for a few years following the completion of the Norwich line has not been ascertained, but in 1848 he was living in Boston, Mass. At that time he had an office at 23 Railroad Exchange as Consulting Engineer for railway location and surveys, dams, bridges and wharves. In July of that year he assisted in founding the Boston Society of Civil Engineers, the oldest existing engineering society in this country.

Very soon after this he became the Engineer of the Central Railroad of New Jersey, and made plans for the extension of the road from Whitehouse to Easton, in 1849. He remained Chief Engineer of this line for about three years.

In 1852 he had an office at 247 Broadway, New York. In the record of attendance at the meeting at which this Society was organized, his name is first. He was one of the leading spirits of the Society during its first two years, and held the office of President for fifteen years.

At the Annual Meeting of the Society, held November 6th, 1867, the following resolution was passed:

"*Resolved*, That we tender our thanks to Mr. James Laurie for his faithful services as our President, for his efforts to re-establish and reorganize this Society on a basis which gives promise of a successful and useful continuance, and particularly for his care of our funds, to which we are greatly indebted for our present unencumbered and hopeful condition."

It is interesting to notice in this connection that the original constitutions of this Society and of the Boston Society of Civil Engineers

* Memoir prepared from papers on file in the Library of the Society, and information furnished by J. W. Adams, W. E. Worthen, Walter Katté, C. H. Myers, Clemens Herschel and G. H. Bishop, Members Am. Soc. C. E., and Mr. Samuel Nott.

are alike in many respects, which apparently indicates that Mr. Laurie's experience at the time of the founding of the Boston association proved useful to this Society during its organization.

In 1855 and 1856 he made a number of examinations of bridges in New York for the State authorities. In 1858 he was employed by the Province of Nova Scotia under a resolution requiring the employment of a competent engineer to report fully on the condition of the Nova Scotia Railway, the sum it should have cost and the expense of various extensions, besides matters relating to the operation of the lines. In 1859 and 1860 he was Engineer of this railway, and prepared plans for various extensions.

In 1862 he made elaborate surveys and a voluminous report on the Troy and Greenfield Railroad and the Hoosac Tunnel, and was retained as Consulting Engineer on this work by the State of Massachusetts for several years.

It was in 1862, also, while Chief Engineer of the New Haven, Hartford and Springfield Railroad, that he designed what is probably his greatest work, the bridge across the Connecticut River at Warehouse Point on the line of the New York, New Haven and Hartford Railroad. The iron work for this structure was bought in England, Mr. Laurie having gone there for the purpose and made a contract with William Fairbairn & Company of Manchester. It is a notable American example of riveted bridge work, one of its spans being 177.25 ft. long. Its many years of service cast no discredit upon its designer, when the increase in weight of rolling stock since 1862 is considered, and especially when it is understood that it is still in service on one of the main trunk lines of the country, while most bridges of the same age of a different form of structure have passed out of existence. The cost of the bridge, erected and completed, was 12.38 cents per pound in gold.

After the completion of this bridge in 1866 it is believed that Mr. Laurie spent his remaining days at Hartford. He was a bachelor and lived at the Allyn House. He was sometimes retained to report on various engineering works, among these engagements being an examination of the Lyman Viaduct on the Air Line Railroad about 1870, and an examination of the Eads Bridge at St. Louis for the bondholders, but as he had accumulated considerable property he lived practically in retirement until his death on March 16th, 1875. He had been ill for some time, and, though not confined to his room, was under the care of a physician.

He was buried in the Cedar Hill Cemetery at Hartford and a granite monument about 25 ft. high was erected on the spot. On one side of this monument there is a bronze likeness of Mr. Laurie, with an inscription below ending: "By his talents and industry he gained the foremost rank in his profession."

His personal clerk and draftsman during the extension of the Central Railroad of New Jersey in 1850–52 was Walter Katté, M. Am. Soc. C. E., who pays the following tribute to his engineering ability:

"I have always felt the deepest respect and gratitude for the great benefit I derived from my experience, short as it was, under him. I learned a great many lessons at that time which have been of incalculable benefit to me since, especially in his exactitude of office methods and the sterling excellence of his designs in engineering practice. Had he lived in this epoch, instead of half a century earlier, he would have assuredly been found in the forefront of our present heaviest and most important engineering enterprises."

MAX JOSEPH BECKER, Past-President Am. Soc. C. E.*

DIED AUGUST 23D, 1896.

Max Joseph Becker was born at Coblenz, Germany, June 20th, 1828, and was educated in the schools of Coblenz, and at the University of Bonn.

After leaving the University, he passed the requisite examinations for admission to service on the Government Railroad surveys, and in 1848 began his professional career on the Cologne and Minden Railroad in the capacity of "engineer's apprentice" (rodman), with headquarters at Hamm, in Westphalia.

This work was interrupted by the Rebellion of 1848, and by reason of his connection therewith he was compelled to leave Germany, along with such men as Frederick Hecker, Carl Schurz, Franz Sigel, August Willich, and others, whose enforced exile has been our country's gain.

After a brief sojourn in Switzerland, he came to the United States, landing in New York in 1850. His first year's residence in this country was a struggle for a foothold, during which he tried various lines of employment, among others, making surveys in Connecticut for a map-publishing house, as draftsman in an engraving establishment, and even tried his hand at journalism on the staff of the *Abendzeitung*.

In December, 1851, he entered the service of the Steubenville and Indiana Railroad at Steubenville, Ohio, under Jacob Blickensderfer, Jr., M. Am. Soc. C. E., Chief Engineer. His first service with this company was as a draftsman, but this was soon changed to transitman on location, and then to Resident Engineer on construction, in which capacity he continued until the completion of the road in 1854.

* Memoir prepared by William Metcalf, Thomas H. Johnson and Samuel Rea, Members Am. Soc. C. E.

From 1854 to 1856 he held no salaried position, doing such professional work as offered, and occupying a part of his time in making and publishing a map of Coshocton County, Ohio.

In 1856 he entered the service of the State of Ohio as Resident Engineer on the Ohio Canal, and continued in that position until 1859.

From 1859 to 1861 he was Resident Engineer on the Marietta and Cincinnati Railroad in charge of location and construction. During this time he also rebuilt a suspension bridge over the Scioto River, at Portsmouth, Ohio, which had been destroyed by the undermining of one tower during a flood.

During the presidential campaign of 1860 Mr. Becker took a lively interest in the success of the Republican party, and made numerous speeches in German in various towns and cities of Southern Ohio, where the German element was strong. In appreciation of this Abraham Lincoln commissioned him Postmaster at Portsmouth, Ohio. But the drudgery and the red-tape methods of that office were not suited to his taste, and in 1862 he resigned the office and again took service under his former chief, Mr. Jacob Blickensderfer, Jr., at that time Chief Engineer of the Pittsburgh and Steubenville Railroad. Mr. Becker was placed in charge of construction of the Steubenville Bridge and its approaches, one of the most important structures crossing the Ohio River, and subsequently rebuilt by him.

In 1863 he again went to the Marietta and Cincinnati Railroad to take charge of the location and construction of its extension from Loveland, Ohio, to Cincinnati. His connection with this railroad company continued until 1867, when he became Chief Engineer of the Steubenville and Indiana Railroad, which position he continued to fill in the various companies formed by its consolidation with other roads until he at length had charge of the entire system of the Pittsburgh, Cincinnati, Chicago and St. Louis Railway. For nearly thirty years he not only discharged the responsible duties entrusted to him with rare fidelity and ability, but won the confidence and affection of his associates. To the professional acquirements which made his judgment of such pronounced value, he brought a long experience, a well-balanced mind and a fund of sound common sense, which were of the greatest service in the solution of the many important problems that confronted him from time to time in his railway career.

In January last the Board of Directors sought to make his declining years easier, and to that end relieved him of some of his duties, and changed his title to "Consulting Engineer and Real Estate Agent." But the disease which finally carried him off had even then laid its hand upon him, and he was not permitted to enjoy the rest from labor contemplated by this act. After a brave fight, marked by his usual cheerful serenity, he succumbed on August 23d, and the world lost a gallant,

honest gentleman, who had reflected credit upon his profession and who left a name without a shadow of stain or reproach.

The above record is sufficient to show the power and character of the man, who, coming to this country a political refugee, almost unknown and nearly penniless, at once went to work ardently, at whatever his hand could find to do, to make his own living and to be dependent upon no one. In social moments, when led to speak of his early struggles, his account was of great interest; he threw into it a strain of humor which would have made it laughable if it had not been really pathetic. No attempt of ours to repeat his tale could do it justice, because it would be impossible to reproduce his inimitable style; it is sufficient to say that his marked success and steady rise from obscurity to the highest plane of his profession, where he found himself at home, should be an enduring encouragement to all struggling young men who may sometimes, under pressure of a hard fight, get the mistaken notion into their heads that the world is against them.

Mr. Becker's professional and personal standing among engineers was of the highest; he was an honored and beloved member of the Engineers' Society of Western Pennsylvania; he was a member of its Board of Direction for many years, President for several terms, and most useful in every way.

Mr. Becker was elected a Member of the American Society of Civil Engineers on August 7th, 1872, and was made its President in 1889. At the time of his election his personal acquaintance in the Society was not very large, and some questions were asked; before his term had expired he had won all hearts, as he always did wherever he came into touch with people. Mr. Becker was more than an able engineer, he was a man of force, a gentleman, genial and witty, kind and sympathetic, always ready to lend a helping hand. A man without malice or guile, he had no time for animosities, and his memory will ever remain in the minds of all who knew him.

THEODORE G. ELLIS, M. Am. Soc. C. E.*

DIED JANUARY 9TH, 1883.

Theodore G. Ellis received his early technical training in the office of a Boston civil engineer, where he was engaged in minor capacities on a number of railroad surveys. In 1854 he moved to Connecticut to accept an appointment as Assistant Engineer of the Hartford, Provi-

* Memoir prepared from papers on file at the House of the Society.

dence and Fishkill Railroad. He was placed in charge of a surveying party, and afterwards of the construction of the line from Bristol to Plymouth. When this engagement was completed, he visited Mexico to report on mining properties for Boston parties, and one of his papers before the Society contains a description of the Mexican method of making hard lime floors which he observed during his trip.*

On returning to the United States in 1861 he was engaged on a survey of Boston Harbor and afterwards opened an office in Hartford, Conn., as a surveyor. The next year he enlisted in the Fourteenth Connecticut infantry and served in many engagements during the civil war, among them Chancellorsville, Antietam and Cold Harbor. He was frequently promoted, and before the close of the war had been breveted Brigadier-General.

When peace was restored, General Ellis returned to Hartford and resumed his engineering work. He was engaged in 1867 to make a reconnaissance of such portions of the Connecticut River below Hartford as required improvement, and in this manner became connected with the hydraulic works on which his reputation was chiefly founded. He was engaged on the improvements of this river for many years.

One of his best known experimental works was the investigation of the flow of water through large orifices, which he conducted during the summer of 1874 at Holyoke, Mass., with the assistance of Stephen Holman, F. Am. Soc. C. E. This work was described in a paper† read before the Society, which was awarded the Norman Medal, being the second to receive that distinction.

General Ellis was elected a Member of the American Society of Civil Engineers on February 17th, 1869, and a Fellow on November 21st, 1872. He was Vice-President from November, 1873, to November, 1877, and a Director during 1878. He served on many committees of the Society. Among them were two appointed to investigate the failure of dams at Mill River and Worcester respectively, his associates on the committee for the first being James B. Francis and William E. Worthen, and on the second David M. Greene and William W. Wilson. In December, 1875, he was appointed Chairman of a Committee on "American Engineering at the Centennial Exposition," which was subsequently enlarged and changed to the Centennial Commission of the American Society of Civil Engineers. At the eighth convention of the Society, held at Philadelphia during the Centennial Exposition, he delivered the opening address, which was entitled "The Rise and Progress of American Engineering."‡

He was a frequent contributor to the professional discussions of the Society and presented the following papers in addition to those previ-

* See *Transactions*, Vol. ii, p. 179.
† See *Transactions*, Vol. v, p. 19.
‡ See *Proceedings*, Vol. ii, p. 13.

ously mentioned: "The Aneroid Barometer and its Use in Estimating Altitudes," Volume I, page 277; "Experimental Strains upon a Bowstring Trussed Girder," Volume II, page 107; "Causes of Formation of Bars at River Mouths," Volume II, page 23; "The Flow of Water in Open Channels," Volume VI, page 250.

General Ellis died at Hartford, Conn., on January 9th, 1883, in his fifty-third year.

FREDERICK JANVRIN CARREL, M. Am. Soc. C. E.*

DIED MAY 2D, 1894.

Frederick Janvrin Carrel was a native of St. Aubin, Jersey, England, where he was born on October 16th, 1852. After receiving an education at Cardiff and Malvern, he sailed from England for South Australia. Early in 1870 he obtained employment as Draftsman and Assistant in the office of the Engineer-in-Chief of the colony, and was engaged upon plans and parliamentary estimates for the Georgetown and Kapunda, and Narracourt and Lacepede Bay and other railways, and for harbor and bridge works.

In 1876 he resigned and came to this country. His first work was on the surveys for the West Side Irrigation and Navigation Canal, in California, and, after the completion of the field work, was employed in the office on plans and estimates of this canal. Later, he was engaged on the plans and estimates of the Feather River Water Company, which proposed to construct a system of water-works supplying San Francisco. Then he opened an office in San Francisco as Consulting Engineer, and made maps, sewer plans and mine and river surveys for some time.

In March, 1881, he was employed by the United States Government on the Cascades Canal, in Oregon, and was promoted to the position of First Assistant Engineer, remaining in this service until May, 1886. He then moved to Portland, Ore., where he established the Portland Smelting Works, and became interested in the purchase and sale of mining properties and ore. This business occupied most of his attention until his death, which occurred at Spokane, Wash., on May 2d, 1894. In 1890, he was associated with Mr. Oskar Huber in the construction of the water-works at Cheney, Wash.

He was elected a Member of the American Society of Civil Engineers on March 5th, 1884.

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* Memoir prepared from papers on file at the House of the Society.

CALEB GOLDSMITH FORSHEY, M. Am. Soc. C. E.*

DIED JULY 25TH, 1881.

Caleb Goldsmith Forshey was born on July 18th, 1812, in Somerset County, Pa. He was educated at Kenyon College, Gambier, O., and at the United States Military Academy at West Point, Grant and Sherman being cadets at the latter school at the same time.

After leaving West Point he resided in Natchez, Miss., where he became City Engineer, and was later, 1836–38, Professor of Mathematics and Civil Engineering at Jefferson College, Washington, Miss. From 1847 to 1853 he resided in the town of Carrollton, now a part of New Orleans, and held the position of Town Surveyor. During 1852 and 1853 he was also connected with the United States Topographical Survey of the Mississippi Delta.

He left New Orleans in 1853 to open a military academy at Rutersville, Tex., which he conducted until 1861. When the civil war began, he entered the Confederate army, although previously opposed to secession, and rose to the rank of Lieutenant-Colonel of Engineers. He was in charge of the defences of Galveston at the time of the capture of that city. After the war was over, he held the position of Chief Engineer of the Galveston, Houston and Henderson Railroad until his return to New Orleans in 1872.

He then began his active work in connection with the improvements of the lower course of the Mississippi River, which occupied most of his attention until his death, and mainly established his reputation as an engineer. Records of his work are given in the "Report upon the Physics and Hydraulics of the Mississippi River" by Humphreys and Abbot, in the proceedings of the Levee Commission of 1874, and the reports of the Louisiana Levee Commission, of which he was a member. He was among the first observers to collect data relating to the physics of the Mississippi River, and was placed in charge of a hydrometrical party in the vicinity of New Orleans by Humphreys and Abbot.

He was one of the founders of the New Orleans Academy of Sciences, its first Vice-President, and chairman of the Sections of Meteorology and Civil Engineering. He presented several elaborate papers on the currents of the Mississippi to that organization and was among the first to draw attention to the possibilty of improvements at the mouths of that river. He was an advocate of the St. Philip canal project and opposed the Eads jetty system.

* Memoir prepared from information furnished by B. M. Harrod, G. A. Quinlan and William Starling, Members Am. Soc. C. E.

Possessed of an iron constitution and determined will, he was untiring in his work and indefatigable in his desire to accomplish some good for the welfare of the public, often losing sight of his personal interests in so doing. With a mind prone to and trained in scientific methods, he was charitable in his opinions on everything honestly proposed, but merciless in his open contempt of all that was false or insincere. This last trait of his character militated against a wide personal popularity which his worth fully merited.

He was elected a Member of the American Society of Civil Engineers on August 7th, 1872, and contributed two papers to its *Transactions*, one entitled "The Levees of the Mississippi River," and the other "Cut-Offs on the Mississippi River." He died in New Orleans on July 25th, 1881.

EDMUND FRENCH, M. Am. Soc. C. E.*

DIED JULY 7TH, 1860.

Edmund French, the fifteenth Member of the American Society of Civil Engineers, was a native of Connecticut, and, like many of his contemporaries engaged in railway engineering, received a military education.

He was graduated from the United States Military Academy at West Point as the seventh member of the class of 1828, being a classmate of Professor Albert E. Church, the eminent mathematician. He was assigned to the artillery branch, and in 1828–29 was on duty at the Artillery School at Ft. Monroe, Va. He was then assigned to topographical work and remained on this service until 1833, when he returned to Ft. Monroe. In 1833–34 he was stationed in Creek Nation, but returned to Ft. Monroe again in about a year, where he remained, except for a short stay at Ft. King, Fla., until his resignation from the service in May, 1836. At the time of his resignation he was a First Lieutenant of Artillery.

In civil engineering, he had a varied experience. In 1836–38 he was Assistant Engineer of the Croton Aqueduct of New York, and in 1838–47 Superintending Engineer of the Croton Dam and the Upper Section of the Croton Aqueduct. From 1847 to 1852 he was Resident Engineer of the Hudson River Railroad, and its General Superintendent in 1852–57. During 1852 he was also Superintendent of Machinery and Mechanical Engineer of this road. These duties did not occupy all his time, however, for he was General Superintendent of the Troy and Albany Railroad in 1851–57, Chief Engineer of the Newburgh, N. Y.,

* Memoir prepared from information in "The Biographical Register of the Graduates of the United States Military Academy," by General G. W. Cullom.

Water-Works in 1852–57, and Chief Engineer of the Troy Union Railroad in 1852–57.

In 1857–59 he was Assistant Superintendent of the Treasury Building Extension at Washington, D. C.

He died on July 7th, 1860, aged 53 years, at Georgetown, D. C. He became a Member of the American Society of Civil Engineers on November 26th, 1852.

HENRIQUE HARRIS, M. Am. Soc. C. E.*

DIED OCTOBER 10TH, 1882.

Henrique Harris was born in 1837, and graduated from the Rensselaer Polytechnic Institute in 1861. He engaged in mercantile pursuits until 1870, when he entered the service of the Department of Public Works of Brooklyn, N. Y., in the capacity of District Engineer. He remained in this position until July, 1873, when he resigned to take charge of the public works in New Brunswick, N. J., under the Commissioners of Street and Sewers of that city. This position he held until the fall of 1878. On March 9th, 1879, he was appointed Chief Engineer of the New York and Manhattan Beach Railway, and held this position for some time. He died October 10th, 1882.

Mr. Harris was elected a member of the American Society of Civil Engineers, December 3d, 1873.

ARTHUR MACY, M. Am. Soc. C. E.†

DIED APRIL 14TH, 1891.

Arthur Macy was about twenty-five years of age when he became a Junior of the American Society of Civil Engineers in 1877. He was a graduate of the School of Mines of Columbia College, in the class of 1875, and was subsequently an Assistant in the Department of Assaying in that institution for about two years. During the spring and summer of 1876, he varied this work for a short time by acting as Engineer in charge of certain harbor improvements at Sodus Point, N. Y., which were being made by the Ontario Southern Railroad Company. For a short time in 1877 he was Night Superintendent of the works of the Pennsylvania Lead Company at Mansfield Valley, Pa., but was compelled to resign this position on account of poor health.

After a few months spent in rest and mechanical experimenting, he became Superintendent of the Kings Mountain Mining Company of

* Memoir prepared from papers on file at the House of the Society.

† Memoir prepared from papers on file at the House of the Society.

North Carolina. There he remained for about a year and a half, sinking new works, rebuilding mills, and mining and milling ore. Then he went to Colorado and became Superintendent of the Pride of the West Consolidated Mining Company and of the Silver Mountain Mining Company. In the spring and summer of 1882 he designed and built the works of the Martha Rose Smelting and Mining Company, of which he was Manager until ill health compelled him to take another rest.

In the fall of 1883 he became superintendent of the Silver King Mining Company at Silver King, Pinal County, Ariz., where he made many improvements in the mining plant.

Mr. Macy was elected a Junior of the American Society of Civil Engineers on July 12th, 1877, and a Member on December 2d, 1885.

CHARLES LE GRAND McALPINE, M. Am. Soc. C. E.*

DIED JANUARY 11TH, 1884.

Charles Le Grand McAlpine was born in Albany, N. Y., and was educated at the well-known Albany Academy. For many years he was in the Engineer Department of the State of New York and filled various positions of responsibility in the reconstruction and enlargement of the Erie and other canals of that State. He was also in charge of the construction of several railroads, and his last active direction of location and construction was of the Albemarle and Raleigh road in North Carolina, now a part of the Atlantic Coast line.

His father was connected with the construction of some of the first railway and canal works in the United States, and was associated with John B. Jervis, Hon. M. Am. Soc. C. E., in the construction of the Delaware and Hudson Canal and Railroad. The elder brother of Charles was William Jarvis McAlpine, the third President of the Society, and afterwards an Honorary Member. His extended professional works and his aggressive individuality have made his name notable among American civil engineers. Charles was of a more retiring disposition, with much reserve and dignity of character. With a large experience and a trained judgment in engineering problems, he never sought notoriety. He was, however, a capable adviser in works of importance, and his aid and counsel as consulting engineer were constantly sought by managers and investors in large undertakings.

For a number of years he lived in the city of New York, acting as consulting engineer. He died in that city, January 11th, 1884. His widow was the daughter of the late Thomas Farrington of Tioga County, N. Y. Mr. McAlpine became a member of the Society December 4th, 1867.

* Memoir prepared by John Bogart, M. Am. Soc. C. E.

ROBERT NEILSON, M. Am. Soc. C. E.*

DIED OCTOBER 12TH, 1896.

On the northern shore of Lake Ontario, about 25 miles west of Kingston, is the hamlet of Sandhurst, known also as Fredericksburg, situated in Lennox County, Province of Ontario, Canada. In this place Robert Neilson was born, August 19th, 1837. His parents were Thomas and Eliza Neilson, his father's occupation being that of a farmer.

His boyhood was spent on the farm, and when he became old enough he took active part in the details and management of the work. His early education was received in the schools of his native place, and the improvement of his opportunities fitted him at the age of 19 to become a teacher. He taught in the schools of Fredericksburg from 1856 to 1858, and at the same time prepared himself for entrance to the Polytechnic Institute, at Troy, N. Y., where he began his course in the fall of 1858. He was graduated from this institution in the summer of 1861, and returned to his home intending to follow his chosen profession of civil engineering in his native country.

He made efforts to obtain employment under the Canadian government, but finding that considerable time was necessary to effect this purpose, he again found occupation in farming and as a teacher in the schools of Napanee, near his father's home. This occupied the year 1862 and part of 1863.

In October, 1863, he came to the United States and entered the service of the Pennsylvania Railroad Company as rodman on the construction of the Philadelphia and Erie Railroad, which was opened about a year later. In March, 1864, he was appointed Assistant to Mr. A. J. Cassatt, then Resident Engineer of the Middle Division of the Philadelphia and Erie Railroad between Renovo and Kane, Pa. In September, 1865, he was chosen to succeed Mr. Cassatt as Resident Engineer, and it was during his residence at Renovo that he married Elizabeth J. Wright, June 25th, 1866. His ability as an engineer was again recognized by his appointment, January 1st, 1868, to the position of Resident Engineer of the Middle Division of the main line of the Pennsylvania Railroad between Harrisburg and Altoona.

On the morning of July 17th, 1868, five spans aggregating 830 ft. of the west end of the Pennsylvania Railroad Bridge over the Susquehanna River at Rockville, about 5 miles from Harrisburg, were destroyed by fire. This was a wooden deck bridge of the usual Howe truss form. Mr. Neilson soon reached the scene of the catastrophe, and as trestling

* Memoir prepared by E. D. Nelson, Esq.

could not be well adopted, it was decided to rebuild the permanent bridge at once. It was necessary to remove the wrecked spans, to have the timber sawed and to order the rods, angle blocks and other parts and assemble them at the bridge. The material began to arrive on the third day and the work moved rapidly to completion, the bridge being opened to the passage of trains on July 28th, hardly twelve days after its partial destruction.

Many similar instances might be cited to show his quick comprehension in emergencies, his ready judgment as to the best course to pursue, and his promptness in completing the work in hand.

In January, 1870, he was promoted to the superintendency of the West Penn Division of the Pennsylvania Railroad, which position he held until his transfer, in September, 1874, to the Elmira and Canandaigua Divisions of the Northern Central Railway, as Superintendent. During his superintendency of these divisions he was obliged to take an active part in traffic matters in addition to the duties relating to engineering and transportation which usually devolve upon a railroad superintendent.

His success in all of these departments of railroad work most justly earned for him his promotion, in September, 1881, to the position of General Superintendent of the Philadelphia and Erie Railroad and the Northern Central Railway, north of Harrisburg. In January, 1883, his jurisdiction was extended over the entire line of the Northern Central from Baltimore north, and he continued in this position, as a notably successful operating officer, till the time of his death, October 12th, 1896, at his home at Williamsport, Pa.

His personal characteristics greatly endeared him to his subordinates and associates. Firm in purpose, yet always kind and considerate, he directed his subordinate officers more by his own strong personality and the evident wisdom which he possessed, than by the harsher methods of arbitrary authority; and he built up those under him with the knowledge which by his long experience and clear mind he had gained.

He never refused counsel or advice to those who asked, and he showed a personal interest in the affairs of those who sought his help, which added to the esteem in which he was held by all who came in contact with him.

In the death of Mr. Neilson the Pennsylvania Railroad Company lost one of its most efficient operating officers, and the profession an engineer of pronounced ability in railroad construction and maintenance.

Mr. Neilson was elected a Member of the American Society of Civil Engineers on February 17th, 1869.

JAMES HART RENO, M. Am. Soc. C. E.*

DIED AUGUST 5TH, 1881.

James Hart Reno began his professional career in 1866, when he was about nineteen years old, as Assistant Engineer in charge of the construction of about 8 miles of road on the Allegheny Valley Railway. Early in 1868 he left this position to become a transitman in a party on the Union Pacific Railway in Utah and Nevada. Early in the fall he was given a subdivision on construction in Nevada, which was abandoned later in the year and all the force brought to Utah. There he had charge of construction on the western side of the Promontory, and remained in the service of the company until late in June, 1869. For a few months in the latter part of that year he was Assistant Engineer on the location and construction of the Adirondack Company's roads, and he then entered the service of the Northern Pacific Railway Company. He remained about two years with this company, and had charge of the location and construction of about 93 miles of road. In May, 1872, he took charge of the survey and preliminary location of the line of the Texas and Pacific Railway from San Diego, Cal., to Pinos Villages, Ariz., a distance of 375 miles.

In May, 1873, Mr. Reno began another branch of engineering, as Assistant Engineer in charge of the street construction of the city of Pittsburg, Pa., which work was continued until January, 1877, when he was appointed County Engineer and Surveyor of Allegheny County, Pennsylvania, in charge of all the public structures of the county, including bridges and buildings.

He was elected a Member of the American Society of Civil Engineers, November 5th, 1879.

JOSEPH RUSSELL THOMAS, M. Am. Soc. C. E.†

DIED NOVEMBER 28TH, 1896.

Joseph Russell Thomas was first actively engaged in engineering works during the period when the construction of American gas works was passing from the control of British contractors to those of this country. He was born in Burlington, N. J., on March 11th, 1820, and was educated in the Philadelphia public schools. He learned the trade of a carpenter, but abandoned it to engage in the grocery business.

* Memoir prepared from papers on file at the House of the Society.

† Memoir prepared from papers on file at the House of the Society.

About this time the Camden Iron Works, at Camden, N. J., were started by Messrs. J. W. & J. F. Starr, who placed the gas division of their establishment under the charge of Samuel A. Thomas, an elder brother of the subject of this memoir. It was through the influence of this brother that Joseph A. Thomas was engaged on a Starr contract for vessels under construction at Hoboken. When the work was finished, he entered the employ of Messrs. Stevens of that place, and was engaged on the construction of the "Stevens battery."

By this time, however, the gas business of the Camden works had increased to an unexpected extent, and Mr. Thomas believed that it was destined to still greater development. In 1848 he moved to Camden and entered the employ of the firm. His spare moments were spent in studying engineering subjects, and his aptitude for applying theory to practice soon led to his appointment as superintendent of construction of the firm's contract.

His first undertaking was the erection of the plant of the New York Gas Light Company on the East River between Twenty-first and Twenty-second Streets to replace an old plant which was located at Center and Hester Streets. The work was carried on in 1850–51, being interrupted during the winter by the erection of a gas plant at New Brunswick, N. J., of which Mr. Thomas was likewise superintendent of construction. When these works were finished, he built the plant at Norfolk, Va., for the same contractors.

Somewhat later Mr. Lemuel Davis, of Detroit, Mich., engaged him to rebuild the gas works in that city. These works had been in operation a short time, but had already proved inadequate to the demands of the city, which was growing rapidly. When the work of remodeling the plant was completed in 1852, Mr. Davis is reported to have been so satisfied with the manner in which the undertaking was carried through that he added a substantial bonus to the amount due Mr. Thomas. By this time the latter had achieved a good position among gas engineers, and his services were in considerable demand. He finally became associated again with Mr. J. W. Starr, this time in connection with the Williamsburgh Gas Light Company.

In 1854, when Mr. Thomas was elected engineer and superintendent of this company, Williamsburgh was a straggling suburb of Brooklyn, N. Y., occupying such land as rose above the marshes north of the latter city. It was not a pleasant place and seemed destined to grow slowly. The local gas works was apparently in keeping with the territory it supplied. It is reported to have been an ill-located, ramshackle affair, steadily drifting toward insolvency. The new superintendent had received at Detroit a good preliminary training for the management of such a plant, however, and he soon had affairs on a satisfactory business basis. Williamsburgh and Brooklyn were united politically, and the marshes between the two districts were filled

in. The demand for gas increased rapidly, and under the direction of Mr. Thomas, who was elected a director of the company in 1855, the plant was reconstructed and enlarged until it became one of the best known for completeness of equipment in the country.

In 1883 he severed his active connection with the company's affairs, and became the editor of the *American Gas Light Journal*, a position he held until his death. He also continued his extensive practice as consulting engineer, among his most notable engagements being the design and construction or reconstruction of the plants at Flushing, College Point, Jamaica, Fishkill, Tarrytown, Sing Sing and Poughkeepsie, N. Y., and Long Branch, N. J. The works at the last place he not only built, but also operated for a time until it was in good condition financially.

Although afflicted with serious deafness in his later years, he never lost his interest in the public affairs of Williamsburgh, and was a trustee for many years of the Williamsburgh Public Dispensary, and the Williamsburgh Public Library Association, and was one of the most liberal patrons of the Brooklyn Art Association. He was elected a Member of the American Society of Civil Engineers on October 5th, 1881, and was, in addition, a member or honorary member of the New England Association of Gas Engineers, the Western Gas Association, the Ohio Gas Association, the Guild of Gas Managers and the American Gas Light Association.

Mr. Thomas died at his country home at Glen Ridge, N. J., on November 28th, 1896, after a long illness. His wife and a daughter survived him.

MARSHALL MARTAIN TIDD, M. Am. Soc. C. E.*

DIED AUGUST 20TH, 1895.

Marshall Martain Tidd was born in Woburn, Mass., August 1st, 1827. His early education was obtained in the public schools of Woburn. He lost the use of his right arm when a young child, owing to a fall upon the back of his head which resulted in the paralysis of the arm. Notwithstanding this, he was a very active and capable boy, and delighted in all kinds of out-of-door sports, such as swimming, sailing, canoeing, hunting, fishing, skating, etc., in all of which he excelled, notwithstanding the loss of his arm. He was expert in the use of tools and made many ingenious articles that required skilful work.

At the age of sixteen he went to work on the old Middlesex Canal, and for about two years attended one of the locks in Woburn.

* Memoir prepared by Henry Manley, Dexter Brackett and F. C. Coffin, Members Am. Soc. C. E.

He began his engineering experience as an assistant on the construction of the dam across the Merrimack River at Lawrence, Mass., under Charles S. Storrow, Hon. M. Am. Soc. C. E. This was before the days of photography, and one of Mr. Tidd's duties was to make freehand sketches showing the condition of the work at the end of each month. After the completion of the Lawrence dam he was occupied in drawing on wood and stone for illustrations of machines and mechanical devices. This business he followed for about 25 years, until the introduction of cheaper processes, and the increase in his more strictly civil engineering work caused him to abandon it. He displayed much ability in the use of pen, pencil and brush, his drawings being remarkable for their extreme accuracy and fineness of detail.

During these years he was connected with the construction of the Simpson patent wooden dry docks in East Boston, Mass., and Portland, Me., and was Consulting Engineer and Designer of the dry dock at the Erie Basin in Brooklyn, N. Y.

In 1872 Mr. Tidd was elected Water Commissioner of his native town, the only public office he ever held. Although holding the office of Water Commissioner, he was also practically Engineer of the works, and his connection with these works led to his being engaged to design and superintend the construction of works of a similar character in other places, so that from this time to his death he devoted himself almost exclusively to questions relating to water supply and sewerage.

He designed and superintended the construction of works for the water supply of Natick, Lincoln, Hingham, Marlboro, Hudson, Weymouth, Hyde Park, Cohasset, Randolph, Holbrook, Vineyard Haven, Reading, and Fairhaven, Mass.; Lewiston, Gardiner, Richmond, Calais, Caribou, Dover, Foxcroft, Farmington and Madison, Me.; Hanover, N. H.; St. Stephen, N. B.; Charlottetown, Prince Edward Island; Yarmouth, N. S., and Ashland, Ky. In addition to the preceding he was employed to make improvements or additions to existing works in Fort Smith, Ark.; Tiffin, O.; Woonsocket, R. I.; Manchester and Nashua, N. H.; Bath, Brunswick, Waterville, Bangor, Bar Harbor, Me.; Medford, Melrose, Belmont, Maynard and Attleboro, Mass.

He was employed as an expert to report to capitalists upon the condition and value of many works in the West, also as an expert in cases of the taking of the works of private corporations by municipalities, at Syracuse, N.Y.; Auburn, Me.; Rochester, N.H.; Braintree, Haverhill and Quincy, Mass., and Milford, N. H.; as Consulting Engineer at Helena, Mont., and Phœnix, Ariz.; by the Maine Water Company, Cambridge, Mass., and others. He also designed and built the sewerage system at Marlboro, Mass. At the time of his death, he was employed upon the Bath Water-Works, Me.; the construction of the Woburn sewerage

system, the plan of a sewerage system for Stoneham, Mass.; Bar Harbor, Me., Water-Works, and as Consulting Engineer on the Willimantic, Conn., Water-Works, and Cambridge, Mass., Water-Works; he was also retained as one of the board of arbitration in a suit for mill damages against the town of Attleboro, Mass.

As an engineer, Mr. Tidd's most striking traits were remarkable mechanical ability, keen observation, fertility of resource and entire and complete honesty of purpose.

He was very successful as an expert witness in legal controversies, he had a strong memory, was very careful in the collection of his data, and had a blunt, emphatic manner of stating his opinions which made him an excellent and convincing witness. As an expert engineer he had a very wide practice in the examination of proposed and existing works, and his familiarity with certain branches of mechanical engineering, acquired in the early days when a civil engineer was necessarily a mechanical engineer as well, resulted in his being retained frequently by mill owners.

To know a man completely it is necessary to know his recreations as well as his work. In earlier life Mr. Tidd's recreations were of the active out-of-door sort; later in life, perhaps his greatest interest was in horticulture and the care of his grounds. For a man of moderate means, he had a very fine collection of shrubs, his flowers, fruit trees and lawn were kept in the best of order and his grounds showed remarkable taste. He was a life member of the Massachusetts Horticultural Society, and was wonderfully well informed in all the details of raising fruit and flowers and the care of shrubbery. Another of his interests was his workshop, which was a model in its equipment of tools and their neat arrangement.

His other principal recreation was attendance upon the meetings and excursions of the several engineering societies of which he was an enthusiastic and liberal member.

In his relations with the members of his profession, he was liberal and generous, ever ready to impart freely to a brother engineer who came openly to him, from his knowledge, or the result of his experience.

He was married when about twenty-eight years of age to Abba S. Cole, who died in July, 1893. He had one daughter who survives him, as does also his aged mother.

He was a man of pronounced individuality, active and alert, both of mind and body, an excellent companion, clear-minded, frank, open and generous.

He became a Member of the American Society of Civil Engineers, October 2d, 1878. His death was occasioned by heart failure, the result of a severe attack of the grippe, about two years before.

ALEXANDER SAMUEL DIVEN, F. Am. Soc. C. E.*

DIED JUNE 11TH, 1896.

Descended from Scotch-Irish ancestry, General Alexander Samuel Diven was born February 10th, 1809, in the then town of Catherine, Tioga County, N. Y., now the town of Dix, Schuyler County. He was the son of Captain John Diven, a soldier of the Revolution.

General Diven's early education was acquired in the schools of his native town and in the academies at Penn Yan and Ovid. In 1830 he went to Elmira and entered the office of the late Judge Hiram Gray as a student at law. In this office and that of Fletcher Haight at Rochester he completed his legal studies, maintaining himself in the mean time in part by teaching school in Elmira, and in part at Owego as Deputy County Clerk of Tioga County, which then comprised Chemung County and the present city of Elmira. Admitted to the bar he went to Angelica, Allegany County, in 1833, and opened an office in partnership with George Miles, who a few years later removed to Michigan. General Diven continued his practice alone at Angelica until 1845, when he removed to Elmira. His practice in Angelica was extensive and covered a large portion of western New York. Soon after removing to Elmira he became a member of the firm of Diven, Hathaway and Woods, which, during its existence of fifteen years, was a leading law firm in southern New York. This partnership continued until July, 1861, when it was dissolved to enable its senior member to form a new partnership with his son, George M. Diven. This latter partnership continued only a few years and did not receive much attention from its senior member, owing to the demands upon him of his political, military and business associations. A free soil democrat, General Diven was one of the organizers of the Republican party in the State of New York, and was ever prominent in its councils. He served one term, 1858–59, in the State Senate, and in 1860 was elected a representative to the Thirty-seventh Congress, taking a leading part in its deliberations during that critical period in the nation's history.

In the summer of 1862, after the disastrous Peninsular campaign, when the call was issued for 300 000 men, at the personal solicitation of President Lincoln and Secretary Seward, General Diven and General R. B. Van Valkenburgh, representative from an adjoining district, leaving their seats in Congress, went to their homes to aid in raising a regiment in response to the call. This regiment, the 107th New York, was one of the first, if not the first, to respond to the call. It went out with General Van Valkenburgh as its Colonel and General Diven as

* Memoir prepared by G. M. Diven, Esq.

Lieutenant-Colonel, and reached the front in time to take part in the battle of Antietam. Failing health compelled General Van Valkenburgh to resign his command, and General Diven succeeded to the colonelcy, continuing in command until after the battle of Chancellorsville, in which the regiment took part. Soon after this battle he was commissioned by President Lincoln as Brigadier General, by brevet, and appointed Assistant Provost Marshal General and assigned to the western district of New York, with headquarters at Elmira. This position he continued to hold until the close of the war.

While residing at Angelica, General Diven became interested in the construction of the New York and Erie Railroad and took an active part in extricating the company from its early difficulties and especially in aiding it to procure needed legislation, particularly that which released the company from the loan of $3 000 000 by the State. For several years he was Director, had charge as Commissioner for procuring right of way over a large portion of the line, and with his firm had charge of the legal business of the western end of the line. His connection with this road and its construction brought him into close relations with men eminent in their profession, who, as civil engineers, had charge of the work, among them Major T. S. Brown, William J. McAlpine, James P. Kirkwood and Julius W. Adams.

While engaged in the construction of the New York and Erie Railroad he became interested in the Chemung Railroad, extending from the New York and Erie Railroad, near Elmira, to the then village of Jefferson, now Watkins, at the head of Seneca Lake. He was a director in the company which built this road, which was opened in December, 1849, soon after the Erie Road was opened to Elmira and was operated in connection with the latter road as a continuous line from New York to Jefferson for a couple of years and until the completion of the line to Dunkirk. Soon after the completion of the Chemung Railroad General Diven became interested in the construction of a line from its northern terminus to Canandaigua. The company which constructed the latter road was originally chartered as the Canandaigua and Corning Railroad Company for the purpose of constructing a railroad from Canandaigua to Corning. After the construction of the Chemung Railroad the title of the Canandaigua and Corning Company was by legislative enactment changed to the Canandaigua and Elmira Railroad Company and its route changed to connect with the Chemung Railroad, thus making a continuous line of railroad from Elmira to Canandaigua. The contract for its construction was made with a company of which General Diven was a member. After the completion of this road a still further extension was made by the construction of the Canandaigua and Niagara Falls Railroad, which was also constructed by the same firm of contractors. These three railroads were constructed with a 6-ft. gauge to correspond with that of the New York and Erie Railroad,

and formed a continuous broad-gauge line from Elmira to Niagara Falls. The last built road becoming involved, it was sold on foreclosure, purchased in the interests of the New York Central Railroad Company, its gauge narrowed, and has since been operated by that company. The line from Elmira to Canandaigua is now under the control of the Northern Central Railway Company and is operated by it as a part of the Pennsylvania system in connection with the Elmira and Williamsport Railroad. Soon after the completion of the road to Canandaigua General Diven became interested in the construction of the Williamsport and Elmira Railroad. The Williamsport and Elmira Railroad Company was originally chartered by the legislature of the State of Pennsylvania in 1832, this being one of the earliest railroad charters in the United States. At an early day a line was constructed from Williamsport to Ralston and for a time operated with horses, but was soon abandoned and not used until about 1852, when General Diven took hold of the project, interested certain Philadelphia parties to raise the necessary capital, and, taking the contract for its construction, completed the road in the summer of 1854. While this road was under construction he was also interested in the construction of the Catawissa Railroad, extending from Milton to Tamaqua in the State of Pennsylvania, which, when finished, in connection with the Williamsport and Elmira and other roads formed a continuous line of railroad from Elmira to Philadelphia.

Shortly after the completion of these railroads he became interested in the construction of the main line of the Missouri Pacific Railroad, and was one of the firm of James P. Kirkwood & Company, which had a contract for constructing a large portion of the line. Afterwards, in connection with Lewis J. Stancliff, who had been a civil engineer in the construction of the Erie Railroad, and others, he formed a firm of contractors known as Diven, Stancliff & Co., which took the contract for constructing what was then known as the Southwest Branch of the Missouri Pacific Railroad, a line projected from Franklin on the main line of the Missouri Pacific to Neosho, in the southwestern portion of the state. This line was completed to Rolla, and the firm was engaged on heavy work beyond, when the breaking out of the Rebellion stopped operations.

Upon the reorganization, after the foreclosure sale, of the New York and Erie Railroad Company into the Erie Railway Company in 1862 under the presidency of Nathaniel Marsh, General Diven was elected a Director, and his law firm, then consisting of himself and son, had charge of the legal business of the company west of Susquehanna. Upon the death of Mr. Marsh, soon after the close of the Civil War, General Diven was elected Vice-President of the company, a position he continued to hold, residing meantime in New York City until 1871, when he resumed his residence in Elmira. He again took the vice-

presidency for a few months in 1872, when General Dix was called to the presidency. During this period, in connection with one of his sons, he was interested in a contract for the construction of the Jefferson Railroad, extending from near Susquehanna to Carbondale, Pa., which is operated as a branch of the Erie Railroad. With another son he afterwards constructed what is known as the Nineveh branch of the Albany and Susquehanna Railroad, extending from Nineveh to a connection with the Jefferson Railroad, constructed under the auspices of and operated by the Delaware and Hudson Canal Company. Still later he was engaged with the same son in the construction of a portion of the New York and Canada Railroad along the west shore of Lake Champlain.

With the completion of this work he closed active operations in business affairs. The rest of his life was spent at his old home in Elmira, except for the last twenty years he passed a few months each year at his winter place on the St. John's River, near the city of Jacksonville, Fla. While engaged in no regular active business, he kept himself in touch with the progress of events, took great interest in political affairs, and devoted much of his time and means to benevolent and educational institutions and enterprises. During nearly all his life he was an earnest and active member of the Presbyterian Church.

General Diven was married in 1834 to Amanda M. Beers, who died in 1875. Eight children, four sons and four daughters, were the issue of this marriage, of whom two sons and three daughters survive him. One of the surviving sons, John M. Diven, superintendent of the Elmira Water-Works Company, is an Associate of this Society. A second marriage took place in 1876 to Maria Joy, who still survives.

While the compiler of this sketch feels some delicacy about commenting on the character of the deceased, he may be pardoned for closing with the tribute of another, showing the esteem in which General Diven was held by those who knew him best. For many years he was a member of a select social and literary club which held monthly meetings, and at the first meeting of the club after his death a member prefaced the essay he was to read with the following words:

"I should do less than justice to the emotion of the hour did I fail to voice our sense of loneliness at loss of him but yesterday the Nestor of our circle, so ripe in years, so strong in heart and mind, who since our last meeting has solved the magnificent mystery of death. To his ready soul doors have now swung open, upon whose threshold we have knocked in vain these many years. We shall not forget him. The sparkle of his wit, the dignity of his thought, his kindly sentiment to us each and all, as well, shall linger in our memory till the last of this little circle shall have ceased from earthly effort and followed in his departing footsteps."

General Diven was elected a Fellow of the American Society of Civil Engineers on June 16th, 1870.

JAMES FREDERIC JOY, F. Am. Soc. C. E.*

DIED SEPTEMBER 24TH, 1896.

James Frederic Joy was chiefly noted as the man who once probably, saved the State of Michigan from bankruptcy, although he was also prominent through his connection in important capacities with many of the great railway companies which developed the Central States with marvelous rapidity in the ten years immediately preceding the Civil War. Like many of the men who were conspicuous figures in the railway work of that period, Mr. Joy was a farmer's son. He was born December 20th, 1810, at Durham, N. H., and was brought up in the frugal, industrious manner characteristic of New England country life at the time.

He attended such schools as he could, and finally became himself a teacher in one of them. With the money earned in this way and a little assistance from his father, who was in not very good circumstances, he entered Dartmouth College. He graduated in 1833 and was selected to deliver the valedictory address. Modern languages, particularly French, and history were his favorite studies, and he retained his interest in them to the close of his life, one of his hobbies in later years being the collection of books relating to Washington and the Revolutionary War. From Dartmouth he went to Cambridge and entered the Harvard Law School, where Joseph Story took a particular interest in him. He had to leave Cambridge, however, in a short time and go back to teaching to earn enough money to carry him through the school. He became a preceptor in an academy at Pittsfield and also an instructor in Latin and Greek at Dartmouth College, and after a short time succeeded in laying by enough of his earnings to complete his legal studies.

The young lawyer then decided to hazard his fortunes in the "Northwest" of that time, and accordingly entered the law office of Senator Augustus S. Porter, of Detroit, in September, 1836. In the next year he was admitted to the Michigan bar and soon became a partner of George F. Porter. The firm were the legal advisers of the Bank of Michigan, at that time the only banking institution in the vicinity, and after its collapse Messrs. Joy and Porter were very busy in straightening out the affairs of the corporation. They were so successful in this work that a large and lucrative practice was soon built up, and when in 1847, the State was without funds and in a most embarrassed condition, Mr. Joy's standing was such that he was enabled to save its reputation.

Michigan was at that time suffering from a plethora of public works,

* Memoir prepared from information furnished by George S. Morison, Past-President Am. Soc. C. E., and Allen Bourn, Esq.

into the history of which it is unnecessary to enter here. Among these public works was the Michigan Central Railroad. This property was one which Mr. Joy considered to have considerable value, so he worked with John W. Brooks, a well-known railroad engineer, to induce eastern parties to buy it. The undertaking was successful, the credit of the State was made good, and the young lawyer was launched on his very successful railway career, which, strange to say, in view of the commanding position he won, was never particularly attractive to him, as his preference was for a general practice. The importance of this sale can be shown by quoting Mr. Joy's description of the conditions prevailing in 1846:

"A wave of wild speculation had swept over the country a few years before, which had resulted in almost universal bankruptcy. All the banks in the State had failed. The State itself was utterly bankrupt. It had issued State scrip to pay for work on its railroads until it had become practically worthless. The railroads were of strap rails laid on wooden stringers and well nigh worn out, and its construction could not be continued, nor could the State reconstruct it with heavier rails. The State was prostrate so far as its credit was concerned. There was no railroad through Canada. There was no railroad west of Kalamazoo."

The old portion of the Michigan Central was rebuilt by its new owners, and the railroad was extended to Chicago, being opened in May, 1852. Through the Great Western Railway from Windsor, opposite Detroit, to Suspension Bridge, it formed, with the New York Central Railroad, one of the early trunk lines. The same capitalists who built the Michigan Central Railroad subsequently gathered and built the various lines which formed the Chicago, Burlington and Quincy Railroad (in Illinois), and Mr. Joy was a prime mover in its original construction. On the retirement of Mr. J. W. Brooks in 1865, Mr. Joy became President of the Michigan Central Railroad, and the active head of all the western interests controlled by the same set of capitalists. He was also President of the Chicago, Burlington and Quincy Railroad from 1865 to 1871.

In 1866 the revival of railroad construction after the war began. The Chicago, Burlington and Quincy Railroad terminated at the Mississippi River, but it had a connecting line which extended from Burlington about half way across the State of Iowa, while the Hannibal and St. Joseph Railroad, a Quincy connection, owned in the same interests, formed another western route. This gave an opportunity for extensions on two lines, westward to Nebraska and southwestward to Kansas. Mr. Joy favored the southwesterly extensions. In pursuance of this idea he arranged to construct a branch of the Hannibal and St. Joseph Railroad which should cross the Missouri River at Leavenworth, Kan., and connect with extensions to be built subse-

quently. The arrangements to construct this line were virtually completed when, owing to a disagreement with the Leavenworth authorities, Mr. Joy changed the terminus from Leavenworth to Kansas City. The first bridge across the Missouri was built here under his orders, the result being the development of the most important city on the Missouri at this point. Mr. Joy then took up the Missouri River, Ft. Scott and Gulf Railroad, then locally called the Border Tier Railroad, a line leading south from Kansas City through the eastern tier of counties in Kansas to the Indian Territory, across which it was to be extended to a connection with the railroad system of Texas, and he also built a more westerly line leading south from Lawrence and subsequently connected with Kansas City. Mr. Joy was at this time called the railroad king of the southwest. The Missouri River, Ft. Scott and Gulf Railroad was completed to the southern line of the State in 1870, but a disappointment awaited him here; he failed to secure the right to build across the territory, which was given to the Missouri, Kansas and Texas Railway, and his Kansas system was never developed on the original lines.

During the same period Mr. Joy constructed several important railroads in Michigan, the most prominent being the Jackson, Lansing and Saginaw Railroad, which became a part of the Michigan Central Railroad, and the Chicago and Michigan Lake Shore Railroad (now the Chicago and West Michigan) which follows near the east shore of that lake.

Mr. Joy's connection with the Chicago, Burlington and Quincy Railroad was finally terminated in 1875, when he ceased to be a director. A change took place in the ownership of the Michigan Central Railroad, and Mr. Joy's presidency ended in 1876; this closed his active life as a railroad manager. Mr. Joy, however, retained a strong interest in everything affecting his city, and was earnest in securing the extension of the Wabash system to Detroit. He was a director of this system for several years and its President from 1885 to 1886. His last active railroad work was in connection with the New Fort Street Passenger Station in Detroit and the construction of the railroad from Chicago to Montpelier, O., which gave the Wabash a line under its own ownership between Detroit and Chicago.

Mr. Joy was universally recognized as one of the ablest railroad lawyers of his time. He was, however, an advocate rather than a judge. As a railroad manager he was one of the most energetic promoters the country has ever had; as a conservative manager of an established property, he was less successful. He was a man of remarkably strong personality, and though in his later years his full beard was perfectly white, he retained the apparent energy and activity of his earlier life.

Mr. Joy died on September 24th, 1896, leaving a daughter and three sons. He was elected a Fellow of the American Society of Civil Engineers on November 6th, 1872.

MARK TUCKER SEYMOUR, F. Am. Soc. C. E.*

DIED MAY 30TH, 1885.

Mark Tucker Seymour was born at Stillwater, Saratoga County, N. Y., on March 23d, 1820. He was a descendant of a family which was among the first to settle in that part of the country, and took a prominent part in public affairs at the time of the Revolution.

Mr. Seymour's early life was spent on a farm, his spare moments being given to study, particularly of matters relating to mechanics. His early engineering training was acquired as an apprentice to his eldest brother, who was a surveyor. He spent some time mapping the country in which he lived, and locating and constructing a number of railway lines in the western part of New York State. He afterwards made a specialty of bridge building, his first important contract being for the construction of all bridges on the Erie Railway, among them the original Portage Viaduct. He next undertook extensive contracts in Virginia, which were abandoned at the outbreak of the civil war. In 1869 he had a contract for building bridges on the Union Pacific Railway, including those at Dale Creek and Devil's Gate. He took similar contracts from the Chicago and South Western Road in 1870, the Canadian Southern in 1871, and the Massachusetts Central in 1881. An undertaking of a different character which he also contracted for was the Riverside Drive in New York City. The last ten years of his life were spent in New York, to which city he moved from Chicago where he lived for four years.

Mr. Seymour was elected a Fellow of the American Society of Civil Engineers, July 21st, 1870.

* Memoir prepared from information furnished by George S. Morison, Past-President Am. Soc. C. E., and from papers on file at the House of the Society.